

WHAT IS CLAIMED IS:

1. An electronic watermark embedding apparatus for embedding an electronic watermark in image data, comprising:

electronic watermark data generating means for generating data of an electronic watermark to be embedded in the image data;

electronic watermark embedding means for embedding the electronic watermark in the image data;

image information amount detecting means for detecting an amount of information of the image data in which the electronic watermark is to be embedded and for outputting a signal representing the detected image information amount; and

encoding information detecting means for detecting encoding information from the image data in which the electronic watermark has been embedded and which has been encoded,

said electronic watermark embedding means controlling an amount of the electronic watermark data to be embedded in the image data according to the image information amount signal detected by said image information amount detecting means and the encoding information detected by said encoding information detecting means.

2. An electronic watermark embedding apparatus for embedding an electronic watermark in image data, comprising:

electronic watermark data generating means  
for generating data of an electronic watermark to be  
embedded in the image data;

electronic watermark embedding means for  
embedding the electronic watermark in the image data;

image information amount detecting means for  
detecting an amount of information of the image data in  
which the electronic watermark is to be embedded and  
for outputting a signal representing the detected image  
information amount; and

encoding information detecting means for  
detecting encoding information from the image data in  
which the electronic watermark has been embedded and  
which has been encoded,

said electronic watermark embedding means  
controlling a position of the image data at which the  
electronic watermark data is embedded in the image data  
according to the image information amount signal  
detected by said image data amount detecting means and  
the encoding information detected by said encoding  
information detecting means.

3. An electronic watermark embedding apparatus  
for embedding an electronic watermark in image data,  
comprising:

electronic watermark data generating means  
for generating data of an electronic watermark to be  
embedded in the image data;

electronic watermark embedding means for

embedding the electronic watermark in the image data;

image information amount detecting means for detecting an amount of information of the image data in which the electronic watermark is to be embedded and for outputting a signal representing the detected image information amount; and

encoding information detecting means for detecting encoding information from the image data in which the electronic watermark has been embedded and which has been encoded,

said electronic watermark embedding means controlling strength of the electronic watermark data to be embedded in the image data according to the image information amount signal detected by said image data amount detecting means and the encoding information detected by said encoding information detecting means.

4. An electronic watermark embedding apparatus according to claim 1, wherein said electronic watermark embedding means controls an amount of the electronic watermark data of a particular spatial frequency component to be embedded in the image data according to the image information amount signal.

5. An electronic watermark embedding apparatus according to claim 2, wherein said electronic watermark embedding means controls a position of the image data at which the electronic watermark data of a particular spatial frequency component is embedded in the image data according to the image information amount signal.

6. An electronic watermark embedding apparatus according to claim 3, wherein said electronic watermark embedding means controls strength of the electronic watermark data of a particular spatial frequency component to be embedded in the image data according to the image information amount signal.

7. An electronic watermark embedding apparatus for embedding an electronic watermark in image data, comprising:

electronic watermark data generating means for generating data of an electronic watermark to be embedded in the image data;

electronic watermark embedding means for embedding the electronic watermark in the image data;

image information amount detecting means for detecting an amount of information of the image data in which the electronic watermark has been embedded and for outputting a signal representing the detected image information amount; and

encoding information detecting means for detecting encoding information from the image data in which the electronic watermark has been embedded and which has been encoded,

said electronic watermark embedding means controlling an amount of the electronic watermark data to be embedded in the image data according to the image information amount signal detected by said image data amount detecting means and the encoding information

detected by said encoding information amount detecting means.

8. An electronic watermark embedding apparatus for embedding an electronic watermark in image data, comprising:

electronic watermark data generating means for generating data of an electronic watermark to be embedded in the image data;

electronic watermark embedding means for embedding the electronic watermark in the image data;

image information amount detecting means for detecting an amount of information of the image data in which the electronic watermark has been embedded and for outputting a signal representing the detected image information amount; and

encoding information detecting means for detecting encoding information of the image data in which the electronic watermark has been embedded and which has been encoded,

said electronic watermark embedding means controlling a position of the image data at which the electronic watermark data is embedded in the image data according to the image information amount signal and the encoding information detected by said image information amount detecting means.

9. An electronic watermark embedding apparatus for embedding an electronic watermark in image data, comprising:

electronic watermark data generating means for generating data of an electronic watermark to be embedded in the image data;

electronic watermark embedding means for embedding the electronic watermark in the image data;

image information amount detecting means for detecting an amount of information of the image data in which the electronic watermark has been embedded and for outputting a signal representing the detected image information amount; and

encoding information detecting means for detecting encoding information from the image data in which the electronic watermark has been embedded and which has been encoded,

said electronic watermark embedding means controlling strength of the electronic watermark data to be embedded in the image data according to the image information amount signal detected by said image information amount detecting means and the encoding information detected by said image information detecting means.

10. An electronic watermark embedding apparatus according to claim 7, wherein said electronic watermark embedding means controls an amount of the electronic watermark data of a particular spatial frequency component to be embedded in the image data according to the image information amount signal.

11. An electronic watermark embedding apparatus

according to claim 8, wherein said electronic watermark embedding means controls a position of the image data at which the electronic watermark data of a particular spatial frequency component is embedded in the image data according to the image information amount signal.

12. An electronic watermark embedding apparatus according to claim 9, wherein said electronic watermark embedding means controls strength of the electronic watermark data of a particular spatial frequency component to be embedded in the image data according to the image information amount signal.

13. An electronic watermark embedding apparatus according to claim 1, wherein said encoding information detecting means outputs, as the encoding information, at least one of a quantizer scale code value, an MQQUANT value, and a quantizer matrix value in an ISO/IEC standard 13818 (to be abbreviated as MPEG2 herebelow).

14. An electronic watermark embedding apparatus according to claim 13, wherein said encoding information (to be referred to as  $y$  herebelow) has a relationship of  $y = f(x)$ , where  $f$  represents a function, with a value (to be referred to as  $x$  herebelow) including at least one of the quantizer scale code value, the MQQUANT value, and the quantizer matrix value, said relationship including a relationship of  $dy/dx \geq 0$ .

15. An electronic watermark embedding apparatus according to claim 1, wherein said electronic watermark

embedding means conducts a control operation to increase the amount of the electronic watermark to be embedded in the image data within a predetermined range when an amount of image information indicated by the image information amount signal increases.

16. An electronic watermark embedding apparatus according to claim 2, wherein said electronic watermark embedding means changes, when an amount of image information indicated by the image information amount signal changes, the position of the image data at which the electronic watermark data is embedded in the image data to a position at which the electronic watermark cannot easily fade.

17. An electronic watermark embedding apparatus according to claim 3, wherein said electronic watermark embedding means conducts a control operation to increase the strength of the electronic watermark to be embedded in the image data within a predetermined range when an amount of image information indicated by the image information amount signal increases.

18. An electronic watermark embedding apparatus according to claim 1, wherein said electronic watermark embedding means operates in cooperation with a format converting unit to convert the image data in which the electronic watermark has been embedded into data of an MPEG2 format.

19. An electronic watermark embedding apparatus for embedding an electronic watermark in image data,



comprising:

electronic watermark data generating means for generating data of an electronic watermark to be embedded in the image data;

electronic watermark embedding means for embedding the electronic watermark in the image data;

format converting means for converting the image data into data of an MPEG2 format; and

converted image information detecting means for detecting an amount of information of the image data converted by said format converting means into data of an MPEG2 format and for outputting a signal representing the converted image information;

said electronic watermark embedding means controlling at least one of an amount of the electronic watermark data to be embedded in the image data and strength thereof according to the converted image information signal.

20. A format converter for converting a format of the image data into an MPEG2 format, comprising:

electronic watermark data generating means for generating data of an electronic watermark to be embedded in the image data;

electronic watermark embedding means for embedding the electronic watermark in the image data;

format converting means for converting the image data into data of an MPEG2 format; and

converted image information detecting means

for detecting an amount of information of the image data converted by said format converting means into data of an MPEG2 format and for outputting a signal representing the converted image information;

said electronic watermark embedding means controlling at least one of an amount of the electronic watermark data to be embedded in the image data and strength thereof according to the converted image information signal.

21. An electronic watermark embedding method of embedding an electronic watermark in image data, comprising the steps of:

generating electronic watermark data of an electronic watermark to be embedded in the image data;

embedding the electronic watermark in the image data;

converting the image data in which the electronic watermark data has been embedded into data of an MPEG2 format;

detecting an amount of information of the image data converted into data of the MPEG2 format; and

controlling at least one of an amount of the electronic watermark data to be embedded in the image data and strength thereof according to the detected amount of information of the image data.

22. An electronic watermark embedding apparatus for embedding an electronic watermark in image data, comprising:

electronic watermark data generating means for generating data of an electronic watermark to be embedded in the image data;

electronic watermark embedding means for embedding the electronic watermark in the image data; and

format converting means for converting the image data into data of an MPEG2 format,

said format converting means comprising image information amount detecting means for detecting an amount of information of the image data converted into data of an MPEG2 format and for outputting an image information amount signal, wherein

said electronic watermark embedding means controlling at least one of an amount of the electronic watermark data to be embedded in the image data and strength thereof according to the image information amount signal.

23. A format converter for converting a format of image data into an MPEG2 format, said format converter operating in cooperation with:

electronic watermark data generating means for generating data of an electronic watermark to be embedding in the image data;

electronic watermark embedding means for embedding the electronic watermark in the image data;

format converting means for converting the image data into data of an MPEG2 format,

said format converting means including image information amount detecting means for detecting an amount of information of the image data converted into data of an MPEG2 format and for outputting a signal representing the detected image information amount; and

an electronic watermark embedding apparatus,

said electronic watermark embedding apparatus detecting a quantizing step for a high-frequency component of spatial frequency components of the image data according to the image information amount signal and controlling at least one of an amount of the electronic watermark data to be embedded in the image data and strength thereof.

24. An electronic watermark embedding apparatus for embedding an electronic watermark in image data, comprising:

electronic watermark data generating means for generating data of an electronic watermark to be embedded in the image data;

electronic watermark embedding means for embedding the electronic watermark in the image data; and

format converting means for converting said image data into data of an MPEG2 format,

said format converting means including image information amount detecting means for detecting an amount of information of the image data converted into data of an MPEG2 format and for outputting a signal

representing the detected image information amount,

said electronic watermark embedding means detecting a quantizing step for a high-frequency component of spatial frequency components of the image data according to the image information amount signal and controlling at least one of an amount of the electronic watermark data to be embedded in the image data and strength thereof.

25. An electronic watermark embedding method of embedding an electronic watermark in image data, comprising the steps of:

generating data of an electronic watermark to be embedded in the image data;

embedding the electronic watermark in the image data; and

converting the image data in which the electronic watermark has been embedded into data of an MPEG2 format,

detecting an amount of information of the image data converted into data of an MPEG2 format; and

detecting a quantizing step for a high-frequency component of spatial frequency components of the image data according to the image information amount and controlling at least one of an amount of the electronic watermark data to be embedded in the image data and strength thereof according to the detecting result.

26. An electronic watermark embedding apparatus

for embedding an electronic watermark in image data,  
comprising:

electronic watermark data generating means  
for generating data of an electronic watermark to be  
embedded in the image data;

electronic watermark data embedding means for  
embedding data of the electronic watermark in the image  
data; and

electronic watermark information amount  
detecting means for detecting information of the  
electronic watermark in the image data in which the  
electronic watermark has been embedded and which has  
been encoded and for outputting electronic watermark  
information,

said electronic watermark embedding means  
controlling an amount of the electronic watermark data  
to be embedded in the image data according to the  
detected electronic watermark information.

27. An electronic watermark embedding apparatus  
for embedding an electronic watermark in image data,  
comprising:

electronic watermark data generating means  
for generating data of an electronic watermark to be  
embedded in the image data;

electronic watermark data embedding means for  
embedding data of the electronic watermark in the image  
data; and

electronic watermark information amount

detecting means for detecting information of the electronic watermark in the image data in which the electronic watermark has been embedded and which has been encoded and for outputting electronic watermark information,

said electronic watermark embedding means controlling a position of the image data at which the electronic watermark data is embedded in the image data according to the electronic watermark information.

28. An electronic watermark embedding apparatus for embedding an electronic watermark in image data, comprising:

electronic watermark data generating means for generating data of an electronic watermark to be embedding in the image data;

electronic watermark data embedding means for embedding data of the electronic watermark in the image data; and

electronic watermark information amount detecting means for detecting information of the electronic watermark in the image data in which the electronic watermark has been embedded and which has been encoded and for outputting electronic watermark information,

said electronic watermark embedding means controlling strength of the electronic watermark data to be embedded in the image data according to the electronic watermark information.

29. An electronic watermark embedding apparatus according to claim 26, wherein said electronic watermark embedding means controls an amount of the electronic watermark data of a particular spatial frequency component to be embedded in the image data according to the electronic watermark information.

30. An electronic watermark embedding apparatus according to claim 27 wherein said electronic watermark embedding means controls a position of the image data at which the electronic watermark data of a particular spatial frequency component is embedded in the image data according to the electronic watermark information.

31. An electronic watermark embedding apparatus according to claim 28, wherein said electronic watermark embedding means controls strength of the electronic watermark data of a particular spatial frequency component to be embedded in the image data according to the electronic watermark information.

32. An electronic watermark embedding apparatus according to claim 26, wherein said electronic watermark information detecting means detects information regarding the electronic watermark in the image data in which the electronic watermark has been imbedded and for which image data compression processing is then executed according to an ISO/IEC standard 13818 (abbreviated as MPEG2) and outputs the information.

33. An electronic watermark embedding apparatus



according to claim 26, wherein said electronic watermark embedding means conducts a control operation to decrease the amount of an electronic watermark to be embedded in the image data within a predetermined range when an amount of electronic watermark information indicated by the electronic watermark information increases.

34. An electronic watermark embedding apparatus according to claim 26, wherein said electronic watermark embedding means conducts, when an amount of electronic watermark information indicated by the electronic watermark information decreases, a control operation to increase the amount of an electronic watermark to be embedded in the image data within a predetermined range.

35. An electronic watermark embedding apparatus according to claim 27, wherein said electronic watermark embedding means changes, when an amount of electronic watermark information indicated by the electronic watermark information decreases, the position of the image data at which an electronic watermark is embedded in the image data to a position at which the electronic watermark cannot easily fade.

36. An electronic watermark embedding apparatus according to claim 27, wherein said electronic watermark embedding means changes, when an amount of electronic watermark information indicated by the electronic watermark information increases, the

position of the image data at which an electronic watermark is embedded in the image data to a position at which the electronic watermark cannot easily be perceived.

37. An electronic watermark embedding apparatus according to claim 28, wherein said electronic watermark embedding means conducts a control operation to decrease the strength of the electronic watermark signal to be embedded in the image data within a predetermined range when an amount of electronic watermark information indicated by the electronic watermark information increases.

38. An electronic watermark embedding apparatus according to claim 28, wherein said electronic watermark embedding means conducts a control operation to increase strength of the electronic watermark signal to be embedded in the image data within a predetermined range when an amount of electronic watermark information indicated by the electronic watermark information decreases.

39. An electronic watermark embedding apparatus according to claim 26, wherein said electronic watermark embedding means operates in cooperation with a format converting unit to convert the image data in which the electronic watermark has been embedded into data of an MPEG2 format.

40. An electronic watermark embedding method of embedding an electronic watermark in image data,

comprising the steps of:

providing data of an electronic watermark to be embedding in the image data;

embedding the electronic watermark in the image data;

detecting information regarding the electronic watermark in the image data in which the electronic watermark has been embedded; and

controlling at least one of an amount of the electronic watermark data to be embedded in the image data and strength thereof according to the information regarding the electronic watermark in the image data which is detected by the detecting step.